

Virginia.—The mean temperature was 35.3°, or 1.6° below normal. The highest was 68°, at Birdsnest on the 24th, and the lowest, 4° below zero, at Monterey on the 4th. The average precipitation was 2.20, or 2.18 below normal. The greatest monthly amount was 3.54, at Charlottesville, and the least, 0.75, at Saltville.

Washington.—The mean temperature was 36.5°, or 2.2° above normal. The highest was 74°, at Kennewick on the 10th, and the lowest, 6° below zero, at Hunters. The average precipitation was 7.80, or 2.25 above normal. The greatest monthly amount was 26.93, at East Clallam, and the least, 0.35, at Kennewick. The greatest excess occurred in the western part of the State; in the eastern section the excess was very slight.

West Virginia.—The mean temperature was 32.3°, or about normal. The highest was 62°, at Bluefield on the 18th, and the lowest, 5° below

zero, at Nuttallburg on the 5th. The average precipitation was 1.59, or decidedly below normal. The greatest monthly amount was 2.72, at Weston, and the least, 0.67, at Hewlett.

Wisconsin.—The mean temperature was 18.6°, or 4.8° above normal. The highest was 53°, at Meadow Valley on the 29th, and the lowest, 38° below zero, at Butternut, on the 5th. The average precipitation was 0.97, or 0.68 less than normal. The greatest amount was 2.40, at Howard, and the least, 0.40, at Spooner.

Wyoming.—The mean temperature was 27°, or about 5° above normal. The highest was 70°, at Embar on the 9th, and the lowest, 25° below zero, at Sheridan on the 3d. The average precipitation was 0.79, or only slightly above normal. The greatest monthly amount was 2.21, at Yellowstone, and the least, 0.24, at Lander.

SPECIAL CONTRIBUTIONS.

CLOUD OBSERVATIONS AND AN IMPROVED NEPHOSCOPE.

By C. F. MARVIN, Professor of Meteorology, U. S. Weather Bureau (dated April 15, 1896).

Observations and studies of clouds, their forms, heights, velocities and directions of motion, constitute at present perhaps the most important source of information as to what is going on in the upper atmosphere. Much attention has been concentrated upon the faithful and regular observation of temperature, rainfall, winds, etc., within a few feet of the surface of the earth, but here the influences of local surroundings are always a more or less important factor, whereas the character and behavior of clouds result from the operations of great forces on large masses of the atmosphere, unmodified by important disturbing causes. If thoroughly studied, classified and understood, the cloud phenomena should greatly aid meteorologists in explaining much that is now obscure or unknown concerning the changes of storm and sunshine, wind and calm that constantly succeed one another. Accurate observations of surface conditions have a real importance and value in themselves, and have thus far absorbed practically all the attention, whereas the observation of clouds has generally been accorded a place of secondary importance, and has been conducted in a more or less imperfect manner; in fact, the best class of cloud observations has been made by only a few special students. This subject has been extensively discussed at the several meetings of the International Congress of Meteorologists, and as early as 1891 the matter was placed in the hands of a permanent committee. One result of their labors is shortly to go into effect, namely, an agreement entered into by nearly all the meteorological services of the world to observe and study clouds systematically and according to a uniform scheme at a few selected stations for a period of one year, beginning May 1, 1896.* The observations to be conducted by the Weather Bureau will be made in the most complete and comprehensive manner at Washington, and somewhat less elaborately at other selected stations.

Elements in cloud observations.—The following list sets forth the several elements that may be considered in cloud observations:

- (1) Kind or name of cloud.
- (2) Direction of the cloud from the observer; that is, its azimuth.
- (3) The angular elevation of the cloud above the horizon; that is, its angular altitude.
- (4) The direction of its motion measured on a horizontal plane; that is, the azimuth of its motion.
- (5) The apparent velocity of its motion.
- (6) The height of the cloud; that is, the vertical distance of the cloud above the surface of the earth.

Cloud forms.—Clouds take on an infinite variety of forms and structures, but these, nevertheless, may be grouped into some ten or fifteen classes or typical varieties. A systematic classification of this sort has been presented by the International Cloud Committee that is quite generally acceptable to meteorologists, although any such classifications must always be regarded as purely arbitrary and conventional. The general adoption everywhere of one such classification is highly desirable, as it provides a uniform and convenient system of names for clouds of the different kinds, however objectionable any one classification may be in itself. The cloud committee will publish soon a cloud atlas containing plates representing typical cloud forms obtained by selection from large numbers of cloud photographs.

The following table, which gives the mean heights and velocities of the different cloud forms, will be of interest. The data contained therein is the result of a large number of measurements made at the Blue Hill Meteorological Observatory, Massachusetts:

Mean heights and velocities of clouds grouped into five levels.

[Annals of the Astronomical Observatory of Harvard College, Vol. XXX, Part III Observations made at Blue Hill Observatory. The velocities are given in meters per second.]

	Mean height.		Mean velocity.	
	Summer half year.	Winter half year.	Summer half year.	Winter half year.
	<i>Meters.</i>	<i>Meters.</i>	<i>m.p.s.</i>	<i>m.p.s.</i>
Cirrus level	9,757	8,012	28.0	43.9
Cirro-cumulus level	8,228	5,039	24.1	40.9
Alto-cumulus level	4,228	3,484	11.2	20.2
Cumulus level	1,657	1,571	8.9	13.7
Stratus level	563	454	7.2	10.2

Mean heights and velocities of the different cloud forms.

Cirrus	9,923	8,051	28.5	51.0
Cirro-stratus	8,754	7,846	24.9	38.0
Cirro-cumulus	7,606	6,992	22.9	50.3
Alto-stratus	6,481	2,930	23.3	10.0
Alto-cumulus	3,195	2,931	9.4	21.3
Strato-cumulus	1,957	1,890	8.4	11.5
Cumulus	1,473	1,341	8.7	14.3
Cumulo-nimbus	1,202	1,552	16.8	12.9
Nimbus	712
Stratus	593	503	6.2

The following is the classification recommended by the committee:

Generally each class is divided into two varieties; (a), detached or rounded forms which appear chiefly in dry weather, and (b), widespread veil-like forms seen more frequently in rainy weather. Five main types are recognized:

A. Highest clouds, mean elevation 9,000 meters.

(a) 1. Cirrus, isolated feathery clouds.

(b) 2. Cirro-stratus, fine whitish veil.

*This date has recently been changed to August 1, 1896.—C. A.]

- B. Intermediate clouds, elevation 3,000 to 7,000 meters.
- (a) 3. Cirro-cumulus, fleecy clouds in small white balls and wisps.
 - 4. Alto-cumulus, denser and larger fleecy clouds with shaded portions.
 - (b) 5. Alto-stratus, thick veil of gray or bluish color.
- C. Low clouds, elevation less than 2,000 meters.
- (a) 6. Strato-cumulus, large balls or rolls of dark cloud.
 - (b) 7. Nimbus, rain clouds.
- D. Clouds formed by the diurnal ascending currents.
- 8. Cumulus, wool-pack clouds, elevation of base 1,400 meters, apex 1,800 meters.
 - 9. Cumulo-nimbus, thundercloud; elevation of base 1,400 meters, apex from 3,000 to 8,000 meters.
- E. Elevated fog, below 1,000 meters.
- 10. Stratus, lifted fog.

A more detailed description of the cloud forms classified above will be found in Instructions for Observers of the Weather Bureau, page 18. Washington, 1895.

Name of cloud.—The kind or name of the cloud in any particular case must be decided upon by the observer's own judgment. Instrumental means are unavailable in observing this element. Some of the remaining items in the above list of elements can be observed more or less perfectly without instrumental aid, but others require instruments, and all are much better made by their use. A single instrument suffices for making all the measurements, although special devices are more generally employed in measuring the height of clouds, owing to the need of greater accuracy.

The improved nephoscope.—The instrument employed for general cloud observations is called a nephoscope. Many forms of this instrument have been devised and used, but, with scarcely an exception, they consist of a horizontal mirror so arranged that the reflected image of the cloud in question is observed. In most, or all of the forms with which the writer is familiar, the utility of the instrument is limited more or less, and although some of the elements mentioned above can be observed in a satisfactory manner, others can not be determined at all, or are observed with difficulty or inaccurately. Many forms of nephoscope are inconvenient to use, and the deduction of final results involves unnecessary numerical computations. In the instrument described below, which was devised for the use of the Weather Bureau observers, the writer has sought to extend the utility of the nephoscope to the observation of every possible element; to insure a uniform degree of accuracy; to provide that the manipulation shall be as convenient as possible, and to choose such dimensions that the numerical computations incident to the reduction of observations shall be reduced to the minimum. The writer desires to acknowledge his indebtedness to Prof. Cleveland Abbe for many valuable suggestions.

The instrument is shown in Fig. 1, as arranged for general cloud work. The circular frame, *A*, is mounted upon three leveling screws, and its upper surface is graduated to degrees, numbered from 0 to 360, the numbers increasing in a direction contrary to the direction of motion of clock hands. This direction is adopted at the suggestion of Professor Bigelow, as this sequence of angles conforms to that which obtains in the ordinary conception of trigonometrical functions, as also in the positive cyclonic rotation, and in magnetic elements. The plate and mirror, *M*, revolve smoothly within the circular rim *A*, being carried upon a hollow vertical axis at the center. The arm, *B*, carrying the sighting staff, *S*, also revolves upon the central axis, the outer end traversing the narrow annular space between the mirror and graduated rim. The staff, *S*, is telescopic in construction, and is attached to the arm at *B* by a hinge which permits the staff to be inclined from the vertical to any extent, but always in a plane perpendicular to the mirror. The top portion of the staff is provided with a crosshead, which

is surmounted by a small sighting knob, *s*. The crosshead is adapted to receive the secondary staff, *S'*, which slides with gentle friction through the crosshead, and is tipped at either end with small secondary sighting knobs, *s'* and *s''*. By reason of the telescopic construction of the staff, *S*, the crosshead can not only be turned about in any direction, but it and the sighting knob, *s*, can be raised by various amounts, being held in place by friction. The hinge at *B* is made in such a manner that when the staff, *S*, is placed in a vertical position the small rod sliding inside can be forced down into a hole in the hinge, the effect of which is to lock the hinge so that the staff is held rigidly in a vertical position. The purpose of this arrangement will appear when the manner of using the nephoscope for observing apparent cloud velocities is described.

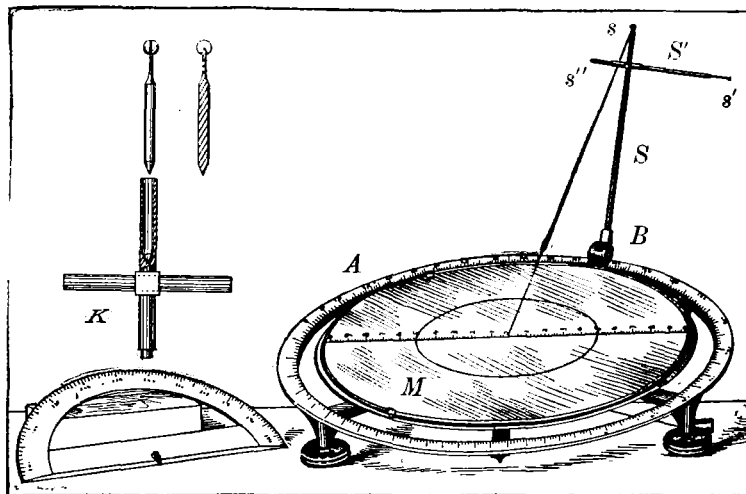


FIG. 1.—The Improved Nephoscope.

A fine line crossing the center of the mirror is etched upon the surface of the glass, and is graduated into millimeters, the zero of the scale being placed at the center. The radius of the mirror is slightly more than 10 centimeters ($4\frac{1}{4}$ inches). Two circles, of 5 centimeters and 10 centimeters radius respectively, are also engraved on the glass.

The center of the glass is pierced with a fine pin hole. A short length of silk twist is passed through this and the hollow axis of the instrument, and has attached to it below a small weight, whereas, the end above the mirror is fastened to the sighting knob, *s*. The thread is kept taut at all times by the small weight below, and if detached from the staff, *S*, is prevented from passing entirely through the mirror by the knob at the end. When in use, the nephoscope is mounted upon a hollow support, most conveniently made with iron piping, thus providing a sufficient space for the movements of the small weight which is a convenient, although not a necessary, adjunct, as the result may be obtained in other ways. The weight is so formed that when not required, or for security in transportation, it may be screwed within the hollow axis of the nephoscope.

The knob, *s*, is shown enlarged at *K* in the figure, the construction there shown being adopted in order that the line of the silk thread shall range accurately with the center of the mirror and the center of the sighting knob, in whatever position the staff may be placed and however the crosshead may be turned. It will be seen from the figure that the sighting knob, *s*, above the crosshead is formed of a separate piece pointed at the lower end, upon which it pivots within the upper portion of the cross. By this construction the thread is prevented from winding around the staff when the latter is rotated. The round knob at the extreme top is slotted so that the thread always draws from the center.

The object of the thread is to facilitate the measurement of the angular altitude of a cloud. In the use of the instrument, the angle between the thread and the mirror is the angular elevation of the cloud observed, which, for most purposes, can be measured with sufficient accuracy by the use of an ordinary semicircular protractor of about 10 centimeters radius ($3\frac{1}{2}$ to 4 inches). The one shown at the side of the figure is provided with a small, pointed projection at the center of the arc. When applied to the mirror so that the point enters the small hole in the center, the angle of the thread may be read off with a very considerable accuracy.

A small level of the usual construction accompanies each instrument, and, if desired, can be permanently attached, although the detached level is believed to be better, and possibly less expensive.

Thus constructed the nephoscope becomes a very accurate cloud altazimuth, and is useful in many other kinds of observation where horizontal and vertical angles are to be measured, such as auroras, halos, kites, wind vanes, etc.

For the best results each instrument should be provided with two mirrors. The one for general use should be made of black glass, ground true and flat. A splendid substitute for the black glass, which is rather difficult to procure, consists of an ordinary piece of clear glass such as is used in mirrors, but from which the silvering has been removed and the surface coated evenly with perfectly black paint. The top surface of such a glass becomes a partially reflecting surface. The loss in brilliancy from the partial reflection is of great advantage in observing strongly illuminated clouds. Nothing more than such a mirror is required, except, in rare cases, when the clouds are dark and are devoid of any distinct and well-defined markings. A silvered mirror reflecting strongly from the top surface is then required. The ordinary mirror, silvered on the back, gives rise to double reflections that, at times, become troublesome.

Exposure.—For repeated and frequent observations some convenient and stable support should be provided and established at a point commanding an uninterrupted view of the sky. The nephoscope is to be placed upon its support so that the zero of the graduated circumference is set to the south point of the horizon. This adjustment being once established, it is convenient to provide that the points of the leveling screws of the nephoscope fall, respectively, the one within a conical hole, another within a V-groove, and the third resting upon a flat surface. When returned to this support after removal the adjustment of the instrument to the south point is preserved.

Methods of observation.—The manner of using the nephoscope will be understood from a description of the method of observing each of the elements given in the list above.

The theory of the nephoscope requires that the mirror be accurately horizontal. This condition is secured in a satisfactory manner by means of the leveling screws, aided by the small level accompanying the instrument.

Passing element number (1) on the list—that is, the name of the cloud, which, as we have seen, must be determined directly—the manner of observing the azimuth of a cloud will be described:

(2). *Looking at the mirror of the nephoscope*, the image of the desired cloud is found, and the observer moves his head until the middle of the cloud image, or whatever point is to be considered, is seen at the very center of the mirror, which is marked by the small hole through the glass. It is necessary of course to avoid double vision by using one eye only. Keeping the cloud image always at the center of the mirror, the sighting staff, *S*, of the nephoscope is revolved about the central axis and inclined until the small sighting knob, *s*, is likewise seen reflected with the cloud from the center of the mirror. At this moment of time the azimuth of the cloud is

the reading on the graduated circle opposite the index attached to the base of the sighting staff.

(3). The angular altitude of the cloud is likewise shown from the setting we have just described—that is, the angle made by the thread as it stretches from the center of the mirror to the center of the sighting knob, *s*, is the altitude of the cloud when it is in range with the knob. This angle is measured by placing the straight edge of the protractor on the mirror with the pointed projection entering the hole in the middle of the mirror.

It will be noticed that thus far the sighting staff is *beyond* the center of the mirror from the observer, so that the reflected image of the staff appears in the mirror. It is also possible to have the staff on the side *next* to the observer, but in this case the adjustment must be made so that the knob, *s*, is in the direct line from the center of the mirror to the observer's eye. The angular altitude of the cloud is given just the same as before, by this method of observing, but the azimuth of the cloud will be 180° different from the reading of the azimuth circle. The first described method is preferable.

(4). *Azimuth of motion of cloud.*—The direction in which the cloud is moving is obtained with the nephoscope as follows:

The cloud in question is brought in range and the sighting knob, *s*, adjusted exactly as described under (2). Unless the cloud is moving very slowly, the image in a very few seconds will be seen to move away from the center of the mirror. Two methods of following the image are now open to the observer:

First method.—Follow the motion of the cloud by keeping the images of the knob and the cloud together, not by moving the sighting staff, which under no circumstances must be changed from its first position, but by moving the head. As the cloud image thus appears to traverse the mirror from the center to the circumference, the mirror is turned upon its axis so that the line of graduations across its surface appears to intersect the cloud and the knob, *s*. When it is found that this line has been set to coincide with the path of the cloud image—that is, when the cloud follows along the line—then the latter is parallel to the direction of the cloud motion. Before describing the manner of reading off the azimuth of the motion, the second method will be given, as follows:

Second method.—Instead of moving the head so that the cloud and the knob may be kept together on the mirror, the head may be kept stationary, that is, the head is held so that the knob is seen always at the center of the mirror. The cloud image will now, even more rapidly than before, appear to move toward the edge of the mirror, which, as before, must be turned until the graduated line is so placed that the cloud appears to follow it closely. Here, again, the line is in the same direction as the cloud motion.

The actual position of the line should be the same whether the cloud image was followed by the first or second method. After following the cloud toward the edge of the plate the reading on the graduated rim, where the cloud appears to pass off the plate, will be by the first method, the direction whence the cloud came, but by the second method the direction toward which the cloud is moving.

The two methods contrasted.—In the first method the speed with which the cloud image traverses the plate depends upon the height of the knob above the mirror. As this is always less than the height of the head above the mirror the apparent speed will be much less by the first than by the second method. The first method is, therefore, not so well adapted to determine the direction of motion of very high or very slow moving clouds, nor those whose forms change greatly in a few seconds. In general, the second method will be best to employ where directions of motion only are desired.

It is important that the different results obtained by the two methods be not confused in case observations are made

in both ways. In observing the apparent velocity of clouds the first method of following the cloud image must alone be used, and while in general the second method is best where directions of motion only are desired, observers will, perhaps, avoid confusion and errors by making both classes of observations by the first method.

It will be noticed here that having adjusted the nephoscope on the cloud, and having set the line on the mirror to coincide with the direction of cloud motion, these operations have determined each of the three elements (2), (3), and (4); that is, the reading on the graduated rim opposite the base of the sighting staff is the azimuth of the cloud; the angle between the thread and the mirror is the angular altitude of the cloud; and finally, the direction of motion is determined from the position of the line on the mirror.

(5). The observation of the apparent velocity of the cloud is attended with a little more complication than any of the preceding elements. It consists in following the cloud image according to the above-described first method, and in noting the number of divisions on the graduated line traversed in a stated number of seconds, for example, 30 seconds. Instead of this we may note the number of seconds required for the cloud image to traverse a fixed distance on the plate, say, for example, from the center to the edge, or half-way to the edge. The two circles engraved on the mirror are for this purpose. In order that the apparent velocity of one cloud may be compared with that of another it is necessary that the vertical distance of the sighting knob above the mirror be constantly the same, or, if different, that the height be known.

Furthermore, the actual velocity can be determined from the apparent velocity when the height of the cloud is known. From many observations that have already been made it has been discovered that there is quite a definite relation between the heights of clouds and their appearance. These relations are roughly indicated in the cloud classification already given, and more accurately in the table of heights and velocities. It therefore results that observations of apparent cloud velocities by the nephoscope can be made to give very fair ideas of the actual velocities of the clouds themselves, and the nephoscope described above has been arranged with particular reference to this use.

For this purpose the hinged joint is locked, in the manner already described, so that the sighting staff assumes its vertical position. The knob, s , is now disregarded and the clouds are sighted with reference to the knobs, s' , or s'' , according to convenience. The arm, S' , slides easily through the crosshead, and can be revolved about the vertical staff, S , which motions, together with the rotation of the staff around the central axis is always sufficient to bring the knobs in range with any cloud, except it be of low elevation (under 20°). The observation of such low clouds is not altogether desirable. The knobs, in whatever position set, are always a constant distance above the mirror, namely: 4.73 inches (12 cm.). The line engraved across the mirror is graduated to millimeters. Accepting these dimensions it will be found on computation that the number of millimeters traversed by a cloud image in 30 seconds will be the velocity of the cloud in miles per hour, provided, the cloud is just one mile high. If the cloud is two miles high the velocity will be double, and so on in like proportion for other heights.

This same relation holds equally well for any other system of units, for example, the space traversed by the cloud image in 30 seconds measured in millimeters is the velocity in kilometers per hour of a cloud 1 kilometer high.

In order to obtain the velocity in meters per second on the basis of a cloud 1,000 meters high, it is necessary to time the cloud for 25 seconds. One-third the space traversed on the

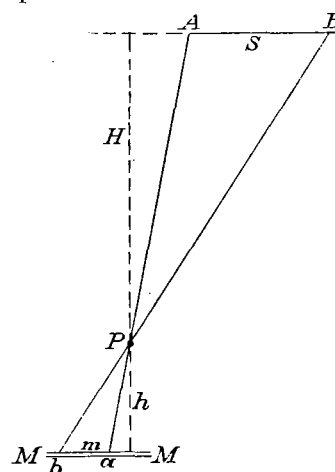
millimeter scale of the mirror is then the velocity in meters per second.

These explanations show the advantage of exercising a proper choice in selecting the dimensions of the parts of the nephoscope, and how simple the computation of actual cloud velocities then becomes.

Owing to the slow motion of the cloud images in some cases, the rapid motion in others, or the rapid change of the cloud forms in still others, it may not always be possible to observe the motion for just the specified time. In such cases the time may be halved or doubled for example. At any rate, the method of observation outlined above forms a good basis for general work in observing apparent cloud velocities.

The relations which exist between the actual velocity of a cloud and the velocity of its image in the nephoscope are brought out in more detail in the following explanation:

The cloud is supposed to move in a horizontal direction, such as AB in the diagram. Its image in the horizontal mirror, Mm , sighted in reference to the knob P , traverses the space ab .



Let S = space traversed by the cloud in time t , and let m = space traversed by the image in the same time.

Let H = height of cloud above the point P ; let h = height of point P above mirror; also, let V = velocity of the cloud. Now from the principles of mechanics:

$$V = \frac{\text{Space}}{\text{time}} = \frac{S}{t}$$

But from the properties of the similar triangles PAB and Pab , whose altitudes are H and h , respectively,

$$S = m \frac{H}{h} \dots \dots (a)$$

Introducing this in the equation above we have for the general equation of velocity:

$$V = \frac{mH}{th}$$

We can now measure the quantities entering this equation (a) in any units whatsoever, according as we desire to express the velocity in (1), miles per hour; (2), kilometers per hour; or (3), meters per second, etc. Moreover we can select such values of t and h , and employ such units of measurement for m that for a convenient height (H = one mile, one kilometer, or 1,000 meters, for example) V may be made numerically equal to m , or, at most, the two shall be in some such simple relation as $V = \frac{1}{3} m$, as already found.

The computations by which these results are obtained are given for the separate cases, as follows:

1. For velocity in miles per hour.

In all cases it will be necessary to measure t in seconds, and it has been found most convenient to measure both m and h in millimeters. For miles per hour in the case of a cloud 1 mile high, we must consider that there are 3,600 seconds in 1 hour. In this case equation (a) may be written:

$$V \text{ in miles per hour} = \frac{3,600 m}{th}$$

Now h and m may be measured in any units so long as the same unit is employed for both. Millimeters are therefore sufficient, and it is plain that if we make t multiplied by h = 3,600, we shall have the exceedingly convenient and simple relation: $V = m$.

This is accomplished if we take t = 30 seconds and h = 120

mm., both numbers fortunately are very convenient and suitable for their respective purposes.

2. For the case of kilometers per hour, it is plain that in the same manner as in (1) the equation of velocity becomes:

$$V \text{ in kilometers per hour} = \frac{3,600}{t h} m$$

and that here again, as before, $V=m$, when t is 30 seconds and h is 120 mm.

3. Finally, for the third case of meters per second the general equation of velocity becomes for a cloud 1,000 meters high:

$$V \text{ in meters per second} = \frac{m}{t h} 1,000$$

The best that can be done in this case, still retaining $h=120$ mm. is to make $t=25$ seconds, whereupon:

$$V = \frac{m}{3,000} 1,000; \text{ or } = V \frac{m}{3}$$

(6). We now come to the consideration of the measurement of cloud heights. This is really a matter of great difficulty, and the present discussion will be confined to explaining how measurements of this sort can be somewhat imperfectly made with the nephoscope. For this purpose two stations may be established within sight of each other and at a known distance apart. A mile or more is necessary for high clouds, but for nephoscopic observations upon clouds of moderate elevations a less distance between stations may be fairly satisfactory. The zero points of the graduated rims of the nephoscopes had best be set exactly on the line between the two stations, although this is not necessary if the azimuth of this line is taken into account.

The observations require that the observers at the two sta-

tions shall first decide upon some particular cloud, or spot on the cloud, to be measured. Telephonic communication is quite indispensable for this purpose. When a mutual identification of a spot has been reached each observer measures with his nephoscope the altitude and azimuth of the spot at the same moment of time. The mathematical computation by which the height of the cloud is deduced from such observations is rather complex and need not be given. The height of the cloud may be determined in a mechanical way, as follows: Lay off a line on the floor having a length corresponding to the distance between the stations. A scale of 1 inch to 100 feet will be convenient. Tack strings to the floor, one exactly at each end of the line. Stretch these strings up through the air so that the angular altitude above the floor corresponds to the altitudes obtained from the observations of the two nephoscopes, respectively. The threads must also make the same horizontal angles with the base line as found from the observation of the azimuth of the cloud. If the two observers sighted at the same point of the cloud and the strings were nicely adjusted, they should intersect at a point above the floor. This point represents the cloud and its vertical distance above the floor, measured on the same scale as the base line, for example, 1 inch equals 100 feet is the desired height of the cloud. Generally, the strings will fail to intersect, which means that the two observers were not looking at the same point. If the discrepancy is not too great, the height of the cloud may be measured from a point midway between the strings where they are nearest together.

The averages of several observations are necessary to get fairly good altitudes. Generally, however, it is necessary to employ theodolites in order that the angles may be measured with greater accuracy and photography is called in to obviate the difficulty of fixing upon a definite point of observation.

NOTES BY THE EDITOR.

THE NEW ENGLAND METEOROLOGICAL SOCIETY.

The Editor has received from Prof. Wm. M. Davis, Secretary of the New England Meteorological Society, a notice stating that the thirty-sixth regular meeting of the Society was held at Boston on April 25, 1896, at which, after reading a number of excellent papers by Rotch, Fergusson, Clayton, and Very, the question of the dissolution of the Society was considered. The Secretary reported that—

Thirty-nine members of the Society, not present at this meeting, had sent in written ballots, 32 being in favor of dissolution, and 7 in the negative; a number of members not voting. It was then moved:

1. That when this meeting adjourns, it adjourns *sine die*, and that the Society be thereby dissolved. This motion was carried by 8 affirmative against no negative votes.

The following recommendations of the Council were then voted:

2. That notice of the votes of this meeting be sent to all members of the Society.

3. That any unexpended balance remaining in the treasury of the Society, after the payment of its obligations, be spent under the direction of Messrs. W. H. Niles, W. M. Davis, and R. de C. Ward, for some meteorological purpose.

4. That notice of the dissolution of the Society be forwarded for publication in the U. S. MONTHLY WEATHER REVIEW, New England Climate and Crop Bulletin, American Journal of Science, Science, Nature, and the Meteorologische Zeitschrift.

5. That any undistributed copies of the Society's investigations be presented to the Astronomical Observatory of Harvard College, to be disposed of by gift, exchange, or otherwise, as shall seem most advisable to the Director of that Observatory.

6. That any publication hereafter received, addressed to the Society, shall be presented to the library of the same Observatory.

On motion, the Society adjourned *sine die*.

Almost simultaneously with the above notice comes the news that the American Meteorological Journal will be dis-

continued with the completion of Volume XII. We have here two events that mark an unfortunate epoch in the history of meteorology in America.

The support of the Journal and the Society has, perhaps, fallen too heavily upon a few persons to whom all must be grateful for their faithful work. The discontinuance of both leaves a gap that ought to be promptly filled. Meanwhile, the weekly journal, Science, has, to a limited extent, opened its columns to communications on meteorological subjects, and those meteorological observers who desire to extend their knowledge of what is going on in this branch of science will have to consult that periodical, as it is the only one in America that now gives prominence to this subject.

MEXICAN CLIMATOLOGICAL DATA.

In order to extend the isobars and isotherms southward so that the students of weather, climate and storms in the United States may properly appreciate the influence of the conditions that prevail over Mexico the Editor has compiled the following table from the Boletina Mensual for January, 1896, as published by the Central Meteorological Observatory of Mexico. The data there given in metric measure have, of course, been converted into English measures. The barometric means are as given by mercurial barometers under the influence of local gravity and therefore need reductions to standard gravity, depending upon both latitude and altitude; the influence of the latter is rather uncertain, but that of the former is well known. For the sake of conformity with the other data published in this REVIEW these corrections for local gravity have not been applied.